Penoscrotal transposition is rarely an isolated event, but is commonly found in proximal hypospadias, and it is a severe anomaly. This anomaly may be complete or incomplete. In the more common incomplete type, the penile body is embedded in the scrotum. Correction of proximal hypospadias with penoscrotal transposition can be done as one and two-staged repairs. Reconstruction of penoscrotal transposition can be combined with chordee release and hypospadias repair. We carried out an alternative one-stage method.
using five flaps and a modification of the Barcat
technique in the patients with proximal
hypospadias and penoscrotal transposition.

Material and Methods

The technique was applied in 14 patients with
proximal hypospadias and penoscrotal transposition. Patient ages ranged from 4 months to 12
years. The position of the meatus was penoscrotal
in 9 patients, scrotal in 4, and perineal in 1. Of the
patients, 2 had previously undergone hypospadias
repair. All patients were operated by a single sur-
geon. No dorsal plication in any patient was
needed for penile straightening.

Surgical Technique: The ventral glans, ure-
thal plate, and median scrotal raphe were infil-
trated with 1:200 000 epinephrine. The first U-
shaped incision with a width of 6 to 8 mm was
made along the urethral plate, toward the dorsal
face of the glans. The second U-shaped incision
was formed in the median scrotal raphe, which
extended toward the perineal area from the sides
of the urethral meatus, as an extension of the former
incision. The penile and scrotal flaps formed by
these incisions were then mobilized and carefully
freed so that they should be thick enough to pre-
serve their vascular supply. They were equal in
length and width. The urethra was mobilized for
0.5 to 1 cm.

The fibrous tissue that induces the chordee
was excised using sharp dissection from just be-
neath the corona down to the penoscrotal junction.
The corpora cavernosa were dissected to proximal
from distal on the ventral face of the penis. This
dissection was extended down to the anterior pubic
rami. Residual chordee was then tested with an
artificial erection.

The third U-flap (pubic flap) was formed by
another U-shaped incision (2 to 2.5 cm x 1.5 to 2
cm) extending to the pubic area from either side of
the urethral meatus. Thus, the upper scrotal folds
on the dorsum of the penis were released and the
penis was transposed anteriorly. The suspensory
ligament should be protected while dissecting the
subcutaneous and deeper tissues in the pubic area.
In addition, the two curved transverse incisions

Figure 1. A. 1.Penile flap. 2.Scrotal flap. 4 and 5. Lateral
scrotal flaps.

Figure 1. B. 3.Pubic flap
with a length of 2 to 2.5 cm just above the upper scrotal folds to form the lateral scrotal flaps are made laterally to the third U flap.

The penile and scrotal flaps were sutured in on-lay fashion to form a neo-urethra using 6-0 polydioxanone interrupted sutures over a 10 to 12 Fr silicone Foley catheter passed into the bladder. The glans was deeply incised in the midline. A triangle spongy tissue from the precise tip of the glans was excised to prevent meatal stenosis. The dorsal neo-urethral lip was sutured to the tip of the glans. The glans wings were closed over the neo-urethra in two layers with subepithelial and epithelial sutures of 6-0 polydioxanone. The divergent edges of the corpus spongiosum and Buck’s fascia were sutured in the midline over the neo-urethra. The ventral skin defect was then repaired. The two halves of the scrotum were widely mobilized. The lateral scrotal flaps were rotated beneath the anteriorly-transposed penis. The incisions were closed in two layers with interrupted sutures of 5-0 polydioxanone. The silicone Foley catheter was kept in place for 12 to 14 days.

Results
The mean follow-up period (ranging from 8 months to 6 years) was 42 months. A fistula requiring re-operation occurred in 3 patients (21.4%), one of whom developed a wound infection. In all cases the fistula developed at the penoscrotal junction or proximal penis. Complications not requiring re-operation included mild meatal stenosis in one patient and postoperative bleeding in another. Mild edema was common, but did not compromise wound healing. No patient required a second procedure to correct chordee and penoscrotal transposition. The success rate of the initial operation was 78.6% (11 of 14). The cosmetic appearance of the penis and scrotum satisfied both the surgeons and parents.

Discussion
The main principles for repair of proximal hypospadias with penoscrotal transposition are correction of the chordee, extension of the penis, creation of a sufficiently long neo-urethra, and transposition of the penis anteriorly and of the scrotum posteriorly. The first question to be addressed in fulfilling these principles is which type of operation is most appropriate for this anomaly.

Figure 2. The penile flap incisions are extended along the urethral plate toward the dorsal face of the glans. The scrotal flap is formed in the median scrotal raphe.

Figure 3. Appearance of the penis and scrotum after hypospadias and penoscrotal transposition repair.
The second question is whether it is appropriate to correct this anomaly in a one-stage procedure as opposed to a two-stage repair. The proximal hypospadias with penoscrotal transposition is frequently treated with a two-stage operation (7). A simultaneous urethroplasty is not recommended since the circular incision made at the base of the penis for correction of penoscrotal transposition compromises lymphatic drainage, which may interfere with healing of the neo-urethra (2). Greenfield et al also advocate the two-stage operation to correct chordee effectively and achieve a nearly normal penile cosmetic appearance with a low rate of complication (8). According to Mori and Ikoma, the penoscrotal transposition should be corrected after urethroplasty (9). But there are reports of one-stage repairs as well (10-12). The present procedure is also applied as one-stage. Perovic and Vu-kadinovic also successfully realized one-stage surgical repair using vascularized penile skin flaps (11). The only disadvantage of this technique is the limited length of the urethra and the spiral skin flap if used. A neo-urethra of adequate length is essential in forming a neo-meatus to be located at the precise tip of the glans in the proximal hypospadias repair. We created a longer neo-urethra by using scrotal flap, which extends toward the perineal area. It may be remembered that the neo-urethra is likely to become hairy because the scrotal flap is formed from the median scrotal skin. However, in an investigation of 12 healthy males between the ages of 20 to 30, we determined that the median scrotal skin with a width of approximately 8 to 10 mm remained hairless.

In recent years, some authors have recommended the Koyanagi procedure for repair of severe hypospadias with penoscrotal transposition (13-15). They reported that the rates of complications requiring further surgery were between 20 and 50%. For the patients in which the Duckett procedure was used, the overall complication rates were noted as 33 to 38% (16,17). Complications are fistula, mega-urethra, and proximal anastomotic strictures. The present procedure is technically easier than Duckett repair, and complications requiring re-operation have been 3 fistulas (21.4%). Barthold et al reported that the fistula rate was 18% in patients with distal or mid-penile hypospadias for whom the modified Barcat technique was used (5). Fistula formation can be decreased by closure of the divergent corpus spongiosum and Buck’s fascia over the neo-urethra, although this remains the most common complication in our series. The viability of the distal ends of the long peri-meatal flaps used to form the neo-urethra may be questioned, but their viability is verified by the fact that the neo-urethra did not break down in any of our patients. However, Redman suggested that no deliberate attempt need be made to preserve the vascularity of the flaps regardless of length, because, for all practical purposes, these may function as free skin grafts (18).

In penoscrotal transposition, the origin of the penis, corporal fixation, and inferior pubic rami are	


deepening of the glans groove without lateral dissection within the glans (5). Although the procedure is usually used for repair of distal hypospadias, it can be applied to more proximal deformities when a longer neo-urethra can be constructed (6). In this study, unlike the original Barcat technique for penile reconstruction, we formed the flaps by extending toward the dorsal face of the glans and the perineal area, dissected the corpora cavernosa down to the anterior pubic rami, and excised the triangular spongy tissue at the tip of the glans. Thus, an effective chordee correction, a longer penile body, and a neo-urethra were provided; and a disproportion between the penile body and neo-urethra was prevented.

abnormal, and the penis is fixed much further back (19). Therefore, we dissected the corpora cavernosa down to the anterior pubic rami and released the upper scrotal folds through a third U incision. Thus, the penis was transposed anteriorly. Furthermore, the lateral scrotal flaps created by the two curved transverse incisions made laterally to the third U-flap have a key role in correcting penoscrotal transposition. Ehrlich and Scardino suggested leaving a skin bridge between the medial aspects of the lateral scrotal flaps to avoid compromising blood supply to the penile skin (10). We agree.

We have used the present procedure for repair of proximal hypospadias with and without penoscrotal transposition since 1990. The advantages of this repair are particularly its applicability in patients who have encountered complications following previous hypospadias repair and penoscrotal transposition. We achieved excellent cosmetic and functional results with a one-stage operation in 78.6% of the patients. As a result, the five-flap technique may be considered for repair of proximal hypospadias with penoscrotal transposition as it provides sufficient penile length, a long and a wide-enough urethral tube, a successful chordee, and penoscrotal transposition correction with a low complication rate.

REFERENCES